MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

DET5088 – ANALOG ELECTRONICS 3

(Diploma in Electronics Engineering)

6 JUNE 2018
2:30 PM –4:30 PM
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6** pages with **5** questions only.

2. Answer **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided.

QUESTION 1 [20 marks]

(a) Define the Operation Amplifier. (3 marks)

(b) Identify the amplifier in Figure 1 below and describe its functions. (3 marks)

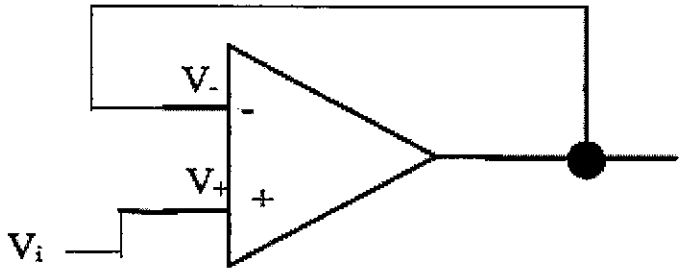

Figure 1

(c) Explain the functions of an instrumentation amplifier. (2 marks)

(d) Briefly explain FIVE (5) types of the filters and sketch its frequency response. (10 marks)

(e) Describe the function of an active All-pass Filter and state its application. (2 marks)

Continued ...

QUESTION 2 [20 marks]

(a) Describe the Slew Rate in the op-amp characteristic. (2 marks)

(b) Explain the importance of a closed-loop configuration with the negative feedback in the practical amplifier. (2 marks)

(c) Explain the THREE (3) stages for the internal structure of an IC op-amp by referring to the input stage, second stage and output stage in Figure 2 below. (6 marks)

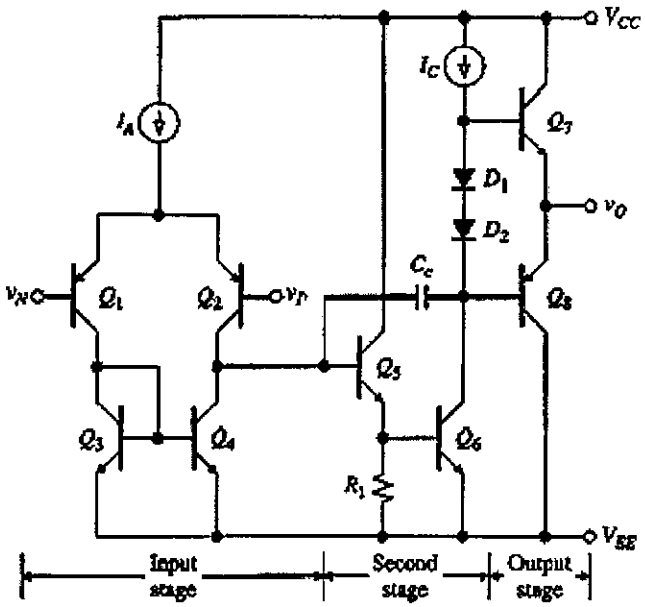

Figure 2

(d) Figure 3 shows a block diagram of the series feedback regulator. Briefly explain the basic operation of this regulator. (10 marks)

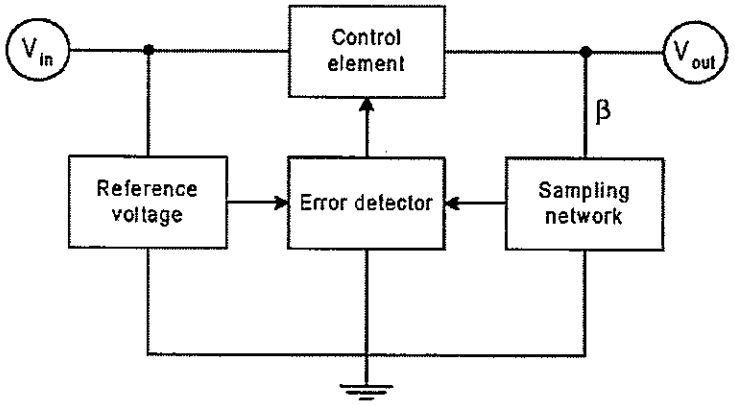

Figure 3

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QUESTION 3 [20 marks]

(a) Define Sinusoidal Oscillators. Then, describe the general principles of oscillation. (4 marks)

(b) Explain the Amplitude Stability in an oscillator. (6 marks)

(c) Describe the difference between the Linear and Non Linear Circuit. (4 marks)

(d) State the function of the comparator and sketch the circuit. (3 marks)

(e) Identify the type of comparator in Figure 4 and explain the function. (3 marks)

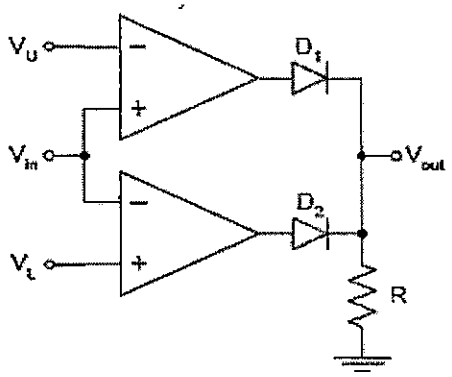

Figure 4

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QUESTION 4 [20 marks]

(a) Figure 5 (a) and Figure 5(b) show an operational amplifier circuit with its input signal respectively.

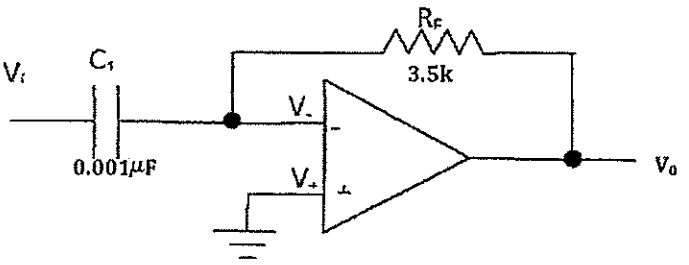

Figure 5 (a)

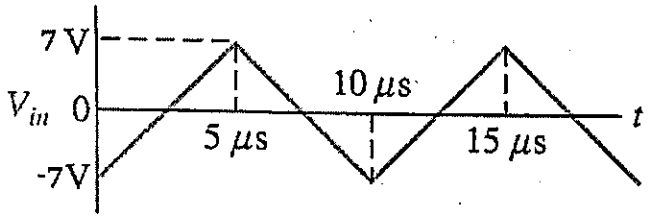

Figure 5 (b)

Referring to the Figure 5(a) and 5(b):

(i) Identify type of the op-amp. (1 mark)

(ii) Calculate and sketch the waveform for output voltage, V_{out}, (10 marks)

(b) Given a band reject filter which has a bandwidth of 5 kHz and Q = 5. Calculate the frequencies of f_H, f_L and f_c of the filter. (9 marks)

Continued ...

QUESTION 5 [20 marks]

(a) Figure 6 shows a non-inverting amplifier with the typical slew rate of 0.75 V/μs. Based on the output voltage swing as a function of load resistor given in Table 1, calculate the following:

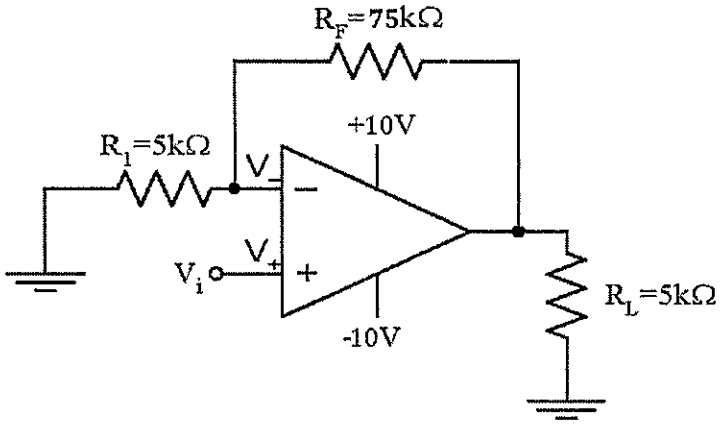

Figure 6

Table 1

Load Resistance	Maximum Positive Output in Volts	Maximum Negative Output in Volts
Greater than 10k Ohm	$V_{CC} - 1$	$V_{EE} + 1$
2 to 10 k Ohm	$V_{CC} - 2$	$V_{EE} + 2$

(i) Maximum operating frequency. (4 marks)
(ii) Maximum peak to peak input voltage allowable. (5 marks)

Continued ...

(b) Figure 7 shows a regulator with the voltage reference, V_z = 5.1 V and a sampling network of R_1 = 15 kΩ and R_2 = 20 kΩ. Calculate the output voltage, V_o.

(3 marks)

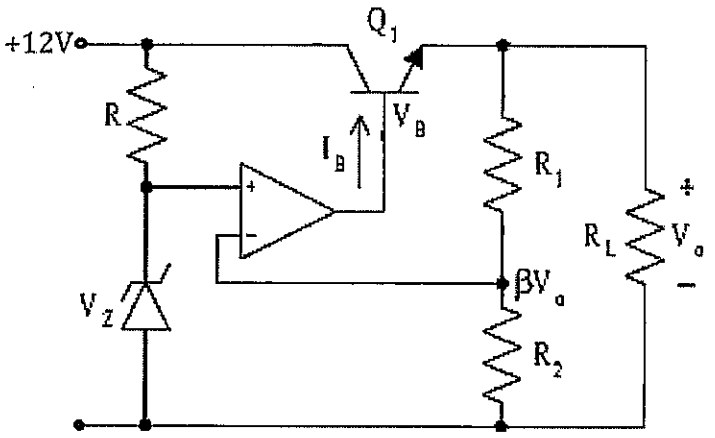

Figure 7

(c) Figure 8 shows the inverting Schmitt trigger with the R_{f1} = 10 kΩ, R_{f2} = 15 kΩ and R_1 = 10 kΩ. Assume that V_{D1} and V_{D2} is 0.7 V with the V_{sat} is ±12V. Answer the following:

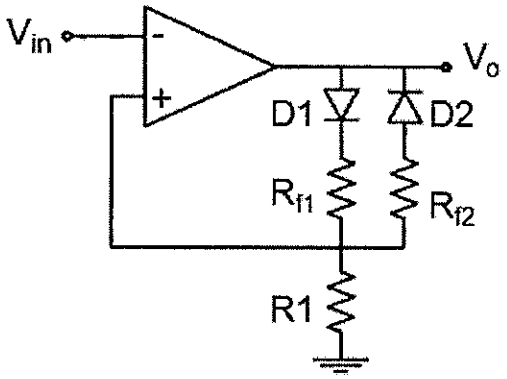

Figure 8

i) Calculate the V_{UTP} and V_{LTP}. (4 marks)

ii) Sketch the input and output waveforms given that the input signal, V_{in} = 28 V_{p-p}. (4 marks)

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